In a MDGM, the left limb of one swath is merged with the right limb of the adjacent swath using a weighted average. More weight is assigned to the pixel with a smaller sum of incident, emission, and phase angles. Since it is very challenging to completely “flatten” the brightness of an image with such a wide range of viewing geometries, seams are still noticeable in MDGMs.

During the production of version 2.0 MDGMs, we have added a normalization step after the application of the photometric model to further “flatten” the residual large-scale brightness variations. This involves deriving an averaged photometrically corrected image swath and using it to normalize each individual image swath (i.e., dividing each swath by the averaged swath). Since a bright polar cap (in one or both hemispheres) shows up in each swath, the bright polar cap remains in the averaged swath. The normalization step will therefore cancel it out, which means that the polar cap in MDGMs is not as bright as it should be. Moreover, the normalization can result in a darker or brighter annular ring in the vicinity of the polar cap edge. This is because the polar cap is non-symmetric, and the polar cap in the averaged swath can be larger or smaller than in each individual swath. In a few mission subphases, we have extrapolated from the area close to the cap edge to the pole to remove the bright cap in the averaged image swath. This results in a bright polar cap and removes the artificial annular ring in black-and-white MDGMs. However, the extrapolation sometimes leads to more severe seams in the polar region and abnormal (non-white) color of the polar cap in MDGMs for that subphase.

In practice, MRO MARCI MDGMs are processed one mission subphase at a time. Since photometric parameters and other normalization data are derived for each mission subphase, strictly speaking, the last day of the first subphase is processed differently than the first day of the second subphase, and so on. To improve consistency between mission subphases, we scale the mean of each MDGM to a common value for each filter and then apply the IDL program “bytscl.pro” to stretch the range to 0 - 255. However, there are still some “jumps” between adjacent mission subphases.

Spacecraft maneuvers often result in anomalous swath shape and imaging geometry. The edges of these swaths have corresponding dents and bumps. These abnormal swaths are more difficult to process and often show up as an anomaly in a MDGM. The effect is most severe in UV filters (band6 and band7) than in Vis filters. Although we try to preserve as much data as possible in MDGMs, we have to crop out some of the affected areas in UV MDGMs so that it won’t look overwhelming.